

<sup>156</sup>Gd(p,d),(p,d $\gamma$ ) 2010A115,2013Ro23

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 160, 1 (2019)	21-Oct-2019

Both references were compiled for XUNDL by K. Abusaleem (University of Jordan) and B. Singh (McMaster).

**2010A115, 2013Ro23:** 825  $\mu\text{g}/\text{cm}^2$  thick, self-supporting <sup>156</sup>Gd target was bombarded by a 25 MeV proton beam from the 88-Inch Cyclotron of LBNL Detection system: Particles were detected using STARS, which consists of two double-sided, annular Si detectors (FWHM $\approx$ 370 keV) confined to  $\theta = 33^\circ - 51^\circ$ .  $\gamma$ -rays were detected with the LIBERACE consisting of six Compton-suppressed HPGe clover detectors (FWHM $\approx$ 3 keV at 1000 keV), one LEPS at 45 $^\circ$  to the beam, and one clover perpendicular to the plane of the LEPS and makes 90 $^\circ$  with the beam.

Measurements: E $\gamma$ , I $\gamma$ , d $\gamma$  coin, d $\gamma\gamma$  coin,  $\gamma\gamma$  coin,  $\gamma$ -d( $\theta$ ), excitation functions, relative cross sections in (p,d) reaction. DWBA analysis of  $\gamma$ d( $\theta$ ) data.

Confirm most of the existing configurations (see Adopted Levels, Gammas dataset). The newly assigned configurations are given in the table database.

Unless mentioned otherwise, all data are from **2010A115**. See discussion in **2013Ro23** and **2014Ro25** for 1296, 5/2<sup>+</sup> level with  $\nu$ 5/2[402] Nilsson assignment, and configuration of other levels compared to those in <sup>153</sup>Gd and <sup>157</sup>Gd.

<sup>155</sup>Gd Levels

E(level)	J $^\pi$	L $^\ddagger$	S# $^\text{@}$	Comments
0.0	3/2 <sup>-</sup>			
60.0108 $^\ddagger$ 6	5/2 <sup>-</sup> $^\ddagger$			
86.5468 $^\ddagger$ 6	5/2 <sup>+</sup> $^\ddagger$			
105.3110 $^\ddagger$ 6	3/2 <sup>+</sup> $^\ddagger$			
107.5806 $^\ddagger$ 10	9/2 <sup>+</sup> $^\ddagger$			
117.9986 $^\ddagger$ 7	7/2 <sup>+</sup> $^\ddagger$			
146.0696 $^\ddagger$ 7	7/2 <sup>-</sup> $^\ddagger$			
214.3511 $^\ddagger$ 14	13/2 <sup>+</sup> $^\ddagger$			
266.6471 $^\ddagger$ 7	5/2 <sup>+</sup> $^\ddagger$			
268.67 10	3/2 <sup>+</sup>	2	67 3	J $^\pi$ : from L=2 and configuration=3/2[402]. In table II, J $^\pi$ =(3/2 <sup>+</sup> ),5/2 <sup>+</sup> . E(level): 274 5 from deuteron spectrum.
321.52 10	5/2 <sup>-</sup> $^\ddagger$		12.1 12	
326.10 11	5/2 <sup>+</sup> $^\ddagger$		3.3 3	
350.4355 $^\ddagger$ 9	7/2 <sup>+</sup> $^\ddagger$			
367.66 10	1/2 <sup>+</sup>	0,1,5	100 3	E(level): 367 7 from deuteron spectrum. J $^\pi$ : from L=0 and configuration=1/2[400]. In table II, J $^\pi$ =(1/2 <sup>+</sup> ),3/2 <sup>-</sup> .
427.15 11	3/2 <sup>+</sup> $^\ddagger$		15.3 2	Uncertainty in cross section seems too low to be realistic.
450.66 11	3/2 <sup>-</sup> $^\ddagger$		46.4 21	
451.3714 $^\ddagger$ 8	1/2 <sup>-</sup> $^\ddagger$		15.7 12	
454.4746 $^\ddagger$ 10	5/2 <sup>-</sup> $^\ddagger$			
488.87 16	5/2 <sup>+</sup> $^\ddagger$		14.9 22	
553.37 10	(7/2 <sup>-</sup> ) $^\ddagger$		4.03 18	
559.35 10	1/2 <sup>-</sup> $^\ddagger$		2.4 3	
592.46 11	5/2 <sup>+</sup>	2	$\geq$ 3.52	E(level): 591 10 from deuteron spectrum. Configuration= $\nu$ 1/2[651] ( <b>2010A115</b> ); new assignment. Relative $\sigma \geq$ 3.52 13.
614.72 12	3/2 <sup>-</sup> $^\ddagger$		3.09 14	
720.56 10	(1/2 <sup>+</sup> )	0,1,4	2.6 3	E(level): 711 13 from deuteron spectrum. Configuration= $\nu$ 1/2[660] ( <b>2010A115</b> ); new assignment. J $^\pi$ : from L=0 and configuration=1/2[660]. In table II, J $^\pi$ =(1/2 <sup>+</sup> ),1/2 <sup>-</sup> , 3/2 <sup>-</sup> ,7/2 <sup>+</sup> .
752.46 12	(7/2 <sup>+</sup> )	0,1,4	4.3 5	E(level): 759 8 from deuteron spectrum.

Continued on next page (footnotes at end of table)

<sup>156</sup>Gd(p,d),(p,d $\gamma$ ) 2010A115,2013Ro23 (continued)

<sup>155</sup>Gd Levels (continued)

E(level)	J $^{\pi}$	L $^{\ddagger}$	S $^{\#@}$	Comments
1296.13 11	5/2 <sup>+</sup>	2	$\geq 34.6$	Configuration= $\nu 7/2[404]$ (2010A115); new assignment. J $^{\pi}$ : from L=4 and configuration=7/2[404]. E(level): 1293 6 from deuteron spectrum.
1551.03 12	(3/2 <sup>+</sup> )	2	$\geq 3.53$	Configuration= $\nu 5/2[402]$ (2010A115); revised assignment. J $^{\pi}$ : from L=2 and configuration=5/2[402]. Relative $\sigma \geq 34.6$ 10. E(level): 1549 7 from deuteron spectrum.
1577.93 10	11/2 <sup>-</sup>	5	$\geq 4.90$	Configuration= $\nu 1/2[411]$ (2010A115); new assignment. J $^{\pi}$ : from L=2 and configuration=1/2[411]. In table II, J $^{\pi}$ =(3/2 <sup>+</sup> ),5/2 <sup>+</sup> . Relative $\sigma \geq 3.53$ 20. E(level): 1571 6 from deuteron spectrum. J $^{\pi}$ : from L=5 and $\gamma$ to 13/2 <sup>+</sup> . Relative $\sigma \geq 4.90$ 21.

$\dagger$  From Adopted Levels Gammas dataset.

$\ddagger$  From  $\gamma d(\theta)$  and comparison with DWBA calculations.

$\#$  Label=Relative  $\sigma$ .

$@$  From deuteron spectra.

$\gamma(^{155}\text{Gd})$

E <sub>i</sub> (level)	J $_i^{\pi}$	E $_{\gamma}$	I $_{\gamma}$	E $_f$	J $_f^{\pi}$	Comments
268.67	3/2 <sup>+</sup>	163.40 10	100 5	105.3110	3/2 <sup>+</sup>	
		268.64 10	15.7 7	0.0	3/2 <sup>-</sup>	
367.66	1/2 <sup>+</sup>	262.34 10	100.0 16	105.3110	3/2 <sup>+</sup>	
		281.22 13	5.82 17	86.5468	5/2 <sup>+</sup>	
592.46	5/2 <sup>+</sup>	474.53 17	18.0 15	117.9986	7/2 <sup>+</sup>	
		484.85 11	100 4	107.5806	9/2 <sup>+</sup>	
720.56	(1/2 <sup>+</sup> )	615.25 10	100 12	105.3110	3/2 <sup>+</sup>	
752.46	(7/2 <sup>+</sup> )	665.91 12	100 7	86.5468	5/2 <sup>+</sup>	
1296.13	5/2 <sup>+</sup>	807.29 12	6.0 5	488.87	5/2 <sup>+</sup>	
		841.45 23	2.0 4	454.4746	5/2 <sup>-</sup>	
		868.88 15	9.8 6	427.15	3/2 <sup>+</sup>	
		928.31 18	10.4 7	367.66	1/2 <sup>+</sup>	
		945.91 17	3.6 5	350.4355	7/2 <sup>+</sup>	
		970.05 16	17.1 8	326.10	5/2 <sup>+</sup>	
		1027.37 23	100.0 22	268.67	3/2 <sup>+</sup>	
		1029.5 3		266.6471	5/2 <sup>+</sup>	
		1150.09 24	2.9 4	146.0696	7/2 <sup>-</sup>	
		1190.92 12	43.2 13	105.3110	3/2 <sup>+</sup>	
		1209.3 4	8.3 6	86.5468	5/2 <sup>+</sup>	
		1236.45 20	4.0 4	60.0108	5/2 <sup>-</sup>	
1551.03	(3/2 <sup>+</sup> )	1096.56 12	100 5	454.4746	5/2 <sup>-</sup>	
1577.93	11/2 <sup>-</sup>	1363.55 12	97 5	214.3511	13/2 <sup>+</sup>	
		1470.38 12	100 6	107.5806	9/2 <sup>+</sup>	

I $_{\gamma}$ : I(1027.37)/I(1029.54) $\approx$ 3.7 6.

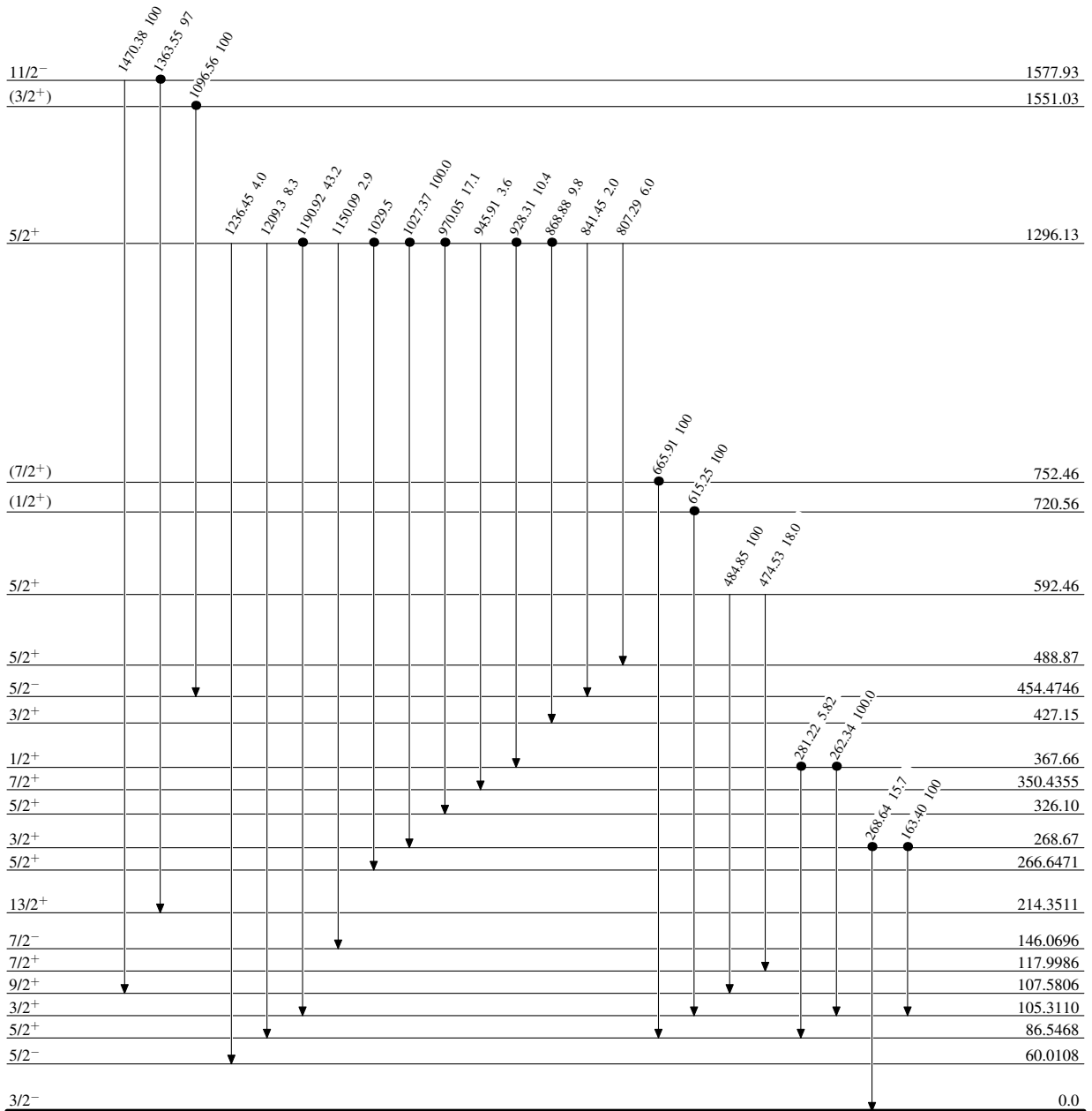
$^{156}\text{Gd}(p,d),(p,d\gamma)$  2010A115,2013Ro23

Legend

Level Scheme

Intensities: Relative photon branching from each level

● Coincidence



$^{155}_{64}\text{Gd}_{91}$